Exhibit 8

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

U.S. Well Services, Inc., and **U.S. Well Services, LLC,** **Plaintiffs,** **v.** **Halliburton Company, and** **Cimarex Energy Co.,** **Defendants.**	**Case No. 6:21-cv-367-ADA** **Jury Trial Demanded**

<u>DECLARATION OF DR. L. BRUN HILBERT, Jr., P.E.</u>

I. INTRODUCTION

1. My name is Dr. L. Brun Hilbert, Jr. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

2. I have been retained to provide technical assistance in this matter. This declaration is a statement of my opinions on issues related to the definiteness of certain patent claims. My employer, Exponent, Inc., is being compensated at the ordinary and customary rate of $510 per hour for my analysis, plus reimbursement for expenses. My compensation does not depend on the content of my opinions or the outcome of this proceeding.

3. Specifically, I have been asked to provide opinions relating to definiteness of claim terms used in the following claims ("Asserted Claims") of the following patents ("Asserted Patents"):

Asserted Patent	Asserted Claims
8,789,601 ('601 Patent)	**1**-7
9,410,410 ('410 Patent)	**1**-9
10,337,308 ('308 Patent)	**1**-11
9,970,278 ('278 Patent)	**1**-6, **9**-16
9,611,728 ('728 Patent)	**1**, 2, 6

Independent claims have been indicated in bold font.

II. EXPERIENCE AND QUALIFICATIONS

4. In formulating my opinions, I have relied upon my knowledge, training, and experience in the relevant art. My qualifications are stated more fully in my curriculum vitae, which has been provided as Appendix A. Here, I provide a brief summary of my qualifications.

5. I am a Principal Engineer at Exponent, Inc. ("Exponent"). I hold a Ph.D. degree in Materials Science and Minerals Engineering from the University of California, Berkeley. I hold a B.S. degree in Mathematics and an M.S. degree in Mechanical Engineering from the University of New Orleans. I am a licensed Professional Mechanical Engineer in California, a licensed Mechanical and Petroleum Engineer in Texas, and a licensed Mechanical Engineer in New Mexico.

6. I have experience and have worked and testified on matters involving hydraulic fracturing operations, well stimulation design, well design and construction, drilling, completions, and production.

7. I was appointed to the National Academy of Engineering (NAE) Committee on Connector Reliability for Offshore Oil and Natural Gas Operations in 2017. This committee was assembled to investigate the causes and prevention of the premature failure of critical bolts on subsea BOPs and wellheads.

8. I was a Society of Petroleum Engineers (SPE) Distinguished Lecturer for 2015-2016. I lectured on the topic Well Design and Integrity: Importance, Risk, and Scientific Certainty.

9. Over the past four decades, I have developed expertise in oil and gas well drilling, completion, and design, well production and wellhead equipment, well stability and sand production, well stimulation and hydraulic fracturing, drilling mechanics, petroleum rock mechanics, reservoir geomechanics, fixed and floating offshore platforms, and the structural integrity and leak resistance of the threaded connections.

10. From 1981 through 1992, I was employed in the Drilling and Completions Division of Exxon Production Research Company in Houston, Texas. While at Exxon Production Research Company, I conducted research and field-specific applications in well design and construction for

wells both onshore and offshore, both in the United States and internationally. I taught courses to Exxon and affiliate engineers in Well Completions and Workovers in the Middle East, Southeast Asia, Australia, Malaysia, and North America. I performed applied research and development in the areas of tubing and casing string design, well design, well completion design, and workovers, and well stimulation design.

11. During my career at Exxon, I worked with domestic and international Exxon Affiliates and their partners on site-specific well designs for challenging fields. While at Exxon Production Research Company, I consulted with Saudi Aramco, Esso Malaysia, and Esso Australia in drilling operations, drill string mechanics, well design, casing and tubing design, cementing design and operations, production and well stimulation, and well abandonment.

12. In 1992, I left Exxon Production Research Company to pursue doctoral studies at the University of California at Berkeley. I obtained a Ph.D. degree from the Department of Minerals Engineering and Material Science in 1995. My dissertation work involved the application of solid mechanics to rock engineering computations, also referred to as geomechanics. I also performed laboratory work on the micromechanics of wave propagation in sandstone rock, which is important in the interpretation of wellbore formation logging.

13. In 1996, I was hired by Exponent, Inc. (formerly Failure Analysis Associates, Inc.) in Menlo Park, California, where I have developed a consulting practice in the areas of Petroleum and Mechanical Engineering. With specific focus consulting to the oil and gas industry, I have performed the failure analysis of wells due to mechanical failure, human factors, and geomechanical deformation mechanisms. I have also performed expert work and litigation support involving onshore and offshore well design and integrity; failure of tubing and casing due to corrosive environments and overloading; analysis of casing and tubing materials and metallurgy;

hydraulically fractured wells; abandonment of wells; well control events; blowouts; well site accidents involving injuries and fatalities; and performance of oil and gas wells.

14. I have published over 100 technical journal articles, reports, and presentations during my career. I have written book chapters on computational geomechanics and underground gas storage. I have taught courses for preparation of taking the professional engineering license examination in Civil Engineering.

15. I believe that my extensive industry experience and educational background qualify me as an expert in the relevant field of oil and gas well drilling, completion, and design, well production and wellhead equipment. I am knowledgeable of the relevant skill set that would have been possessed by a hypothetical person of ordinary skill in the art at the time of the invention of the Asserted Patents (defined above), which I have been instructed to assume is November 2012, for purposes of this proceeding.

16. Therefore, based on my education, professional experience of forty years, and scholarly books and publications, I am an expert in the relevant field of the Asserted Patents and have been an expert in this field since before the Asserted Patents were filed with the United States Patent and Trademark Office ("USPTO").

III. MATERIALS REVIEWED

17. In forming my opinions, I have reviewed the Asserted Patents, including their specifications and prosecution histories. In addition, I have relied on the materials cited throughout my declaration. I reserve the right to respond to any positions that an expert may submit on behalf of USWS.

IV. LEGAL STANDARDS

A. Level of Ordinary Skill in the Art

18. When interpreting a patent, I understand that it is important to identify the relevant art pertaining to the patent-in-suit as well as the level of ordinary skill in that art at the time of the claimed invention. The "art" is the field of technology to which the patent is related.

19. I am informed and understand that the person having ordinary skill in the art ("POSITA") is a hypothetical person who is presumed to know the relevant prior art. I understand that the actual inventor's skill is not determinative of the level of ordinary skill. I further understand that factors that may be considered in determining level of skill include: (i) type of problems encountered in art; (ii) prior art solutions to those problems; (iii) rapidity with which innovations are made; (iv) sophistication of the technology; and (v) educational level of active workers in the field. I understand that not all such factors may be present in every case, and one or more of them may predominate. In a given case, every factor may not be present, and one or more factors may predominate.

20. As of the time of the claimed invention, a POSITA would have either (1) a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Petroleum Engineering or an equivalent field as well as at least 2 years of academic or industry experience in the oil and gas industry, including well drilling, completion, or production, or (2) at least four years of industry experience in the oil and gas industry including well drilling, completion, or production.

B. Legal Background

21. I am not an attorney and do not intend to offer opinions concerning legal issues. Accordingly, I have asked counsel to provide legal background principles that are applicable to the opinions in my Declaration.

22. I have been instructed by counsel on the law regarding claim construction and patent claims, and I understand that a patent may include two types of claims: independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend from an independent claim, or it can further depend from another dependent claim. I understand that a dependent claim includes all the limitations that it recites, in addition to all the limitations recited in the claim(s) from which it depends.

23. It is my understanding claim terms of a patent are given the meaning the terms would have to a POSITA, in view of the description provided in the patent itself and the patent's file history.

24. I understand that to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood the disputed claim language to mean. Such sources include the words of the claims themselves, the remainder of the patent's description, the prosecution history of the patent (all considered "intrinsic" evidence), and "extrinsic" evidence concerning relevant scientific principles, the meaning of technical terms, the technical literature on established and emerging relevant technologies, and the state of the art at the time of the invention.

25. I have been informed that, in order to be valid, the claims of a patent must be sufficiently definite that one skilled in the art can determine the metes and bounds of the claimed invention. I have been informed that a patent claim is deemed "indefinite" if the claim, read in light of the patent's specification and prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. I understand that a claim must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.

V. OPINIONS REGARDING "HIGH PRESSURE" TERMS

A. Claim Language

26. I understand that claim terms are to be evaluated within the context of which they appear. Claim 1 of the '410 Patent is copied below:

> 1. A system for hydraulically fracturing an underground formation in an oil or gas well to extract oil or gas from the formation, the oil or gas well having a wellbore that permits passage of fluid from the wellbore into the formation, the system comprising:
>
> a plurality of electric pumps fluidly connected to the well and powered by at least one electric motor, and configured to pump fluid into the wellbore at **high pressure** so that the fluid passes from the wellbore into the formation, and fractures the formation;
>
> and a variable frequency drive connected to the electric motor to control the speed of the motor, wherein the variable frequency drive frequently performs electric motor diagnostics to prevent damage to the at least one electric motor.

Other apparatus claims include claim 1 of the '601 Patent, claim 1 of the '308 Patent, claim 1 of the '278 Patent, and claim 1 of the '728 Patent, each of which use language identical to the underlined language from the '401 Patent. Claim 9 of the '278 Patent is a method claim and recites, "pumping fracturing fluid into a well in a formation with an electrically powered pump at a <u>high pressure</u> so that the fracturing fluid enters and cracks the formation."

27. I have also been informed that USWS contends the following regarding the "high" pressure term.

> No construction needed. To the extent the term is construed, it should have its plain and ordinary meaning. In the alternative, the term may be construed as "a high pressure so that the fluid enters the formation and fractures the formation." To the extent Defendants argue that the term is indefinite under 35 U.S.C. § 112, USWS contends that the term is not indefinite.

I have been informed that Defendants contend the "high pressure" term is indefinite.

B. Summary of Opinions

28. One must know the meaning of "high pressure" to select a pump adequate for the objective of fracturing a formation, as the necessary pressures across formations and even within the same formation can vary widely, across thousands of pounds per square inch ("psi"). Thus, simply stating, without more, that a pump is configured so that the fluid passes from the wellbore into a formation and fractures the formation, as USWS proposes, does not tell a POSITA with reasonable certainty what pressure is being used and does not define the term of degree, "high pressure." There is no universally accepted definition of the term "high pressure" with regard to pumps for hydraulic-fracturing operations. Even in the context of sufficiency to provide hydraulic fracturing, as USWS proposes, what might be considered a "high pressure" will vary across numerous changing circumstances, including across different formations and even within the same formation.

29. To illustrate these concepts that I discuss below, I have included a series of photographs and figures in this declaration. **Figure 1** is a photograph of a hydraulic fracturing operation that I personally visited in 2012. **Figure 2** is a schematic of the equipment in a typical hydraulic fracturing operation. (Economides, Michael J., and Kenneth G. Nolte. 2000. Reservoir stimulation. Chichester, England: Wiley. Chapter 11.). **Figure 3** is a schematic of pressures vertical in a wellbore during a hydraulic fracturing operation. **Figure 4** is a schematic of the wellbore below the wellhead, exhibiting the casing, perforations, and hydraulic fractures. **Figure 5** is a photograph (from the same hydraulic fracturing operation shown in **Figure 1)** of the manifold skid with the flexible hoses from the pumps. **Figure 6** is a photograph (from the same hydraulic fracturing operation shown in **Figure 1)** of the wellhead with the pipe iron from the manifold skid connected to the wellhead.

C. Pumps on a Hydraulic-Fracturing Site

30. There are many pumps in a hydraulic fracturing operation, as indicated in photograph in **Figure 1** and in **Figure 2**, which is a schematic of a typical hydraulic fracturing operation.

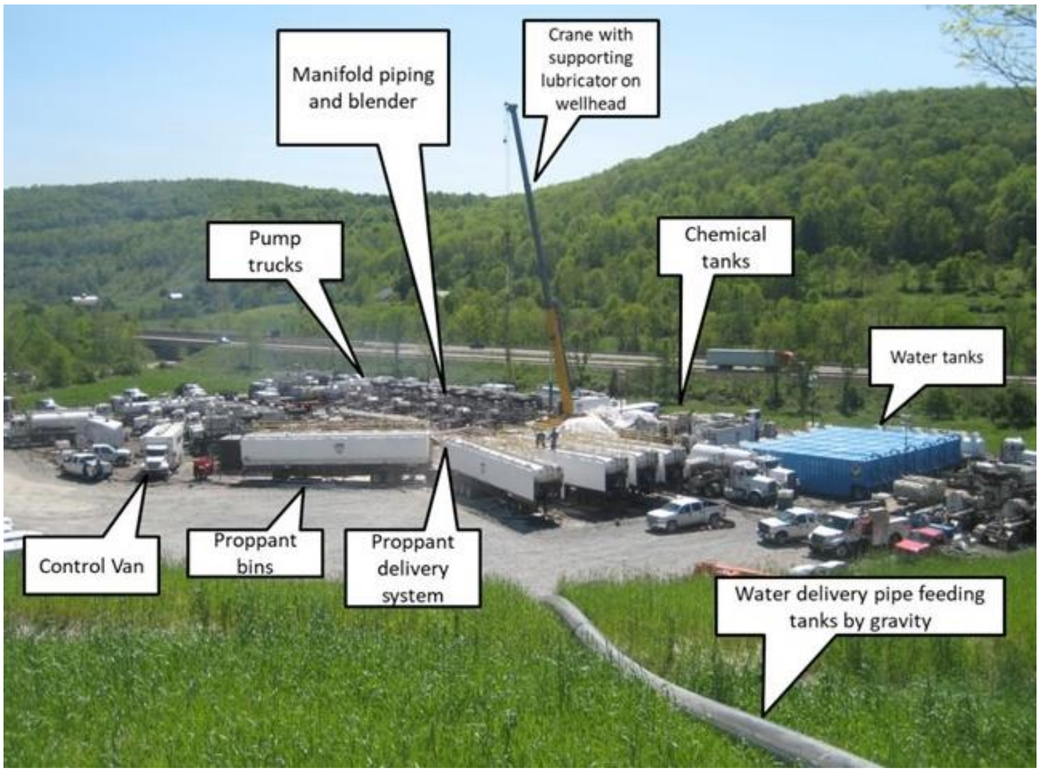

Figure 1. Typical hydraulic fracturing site.

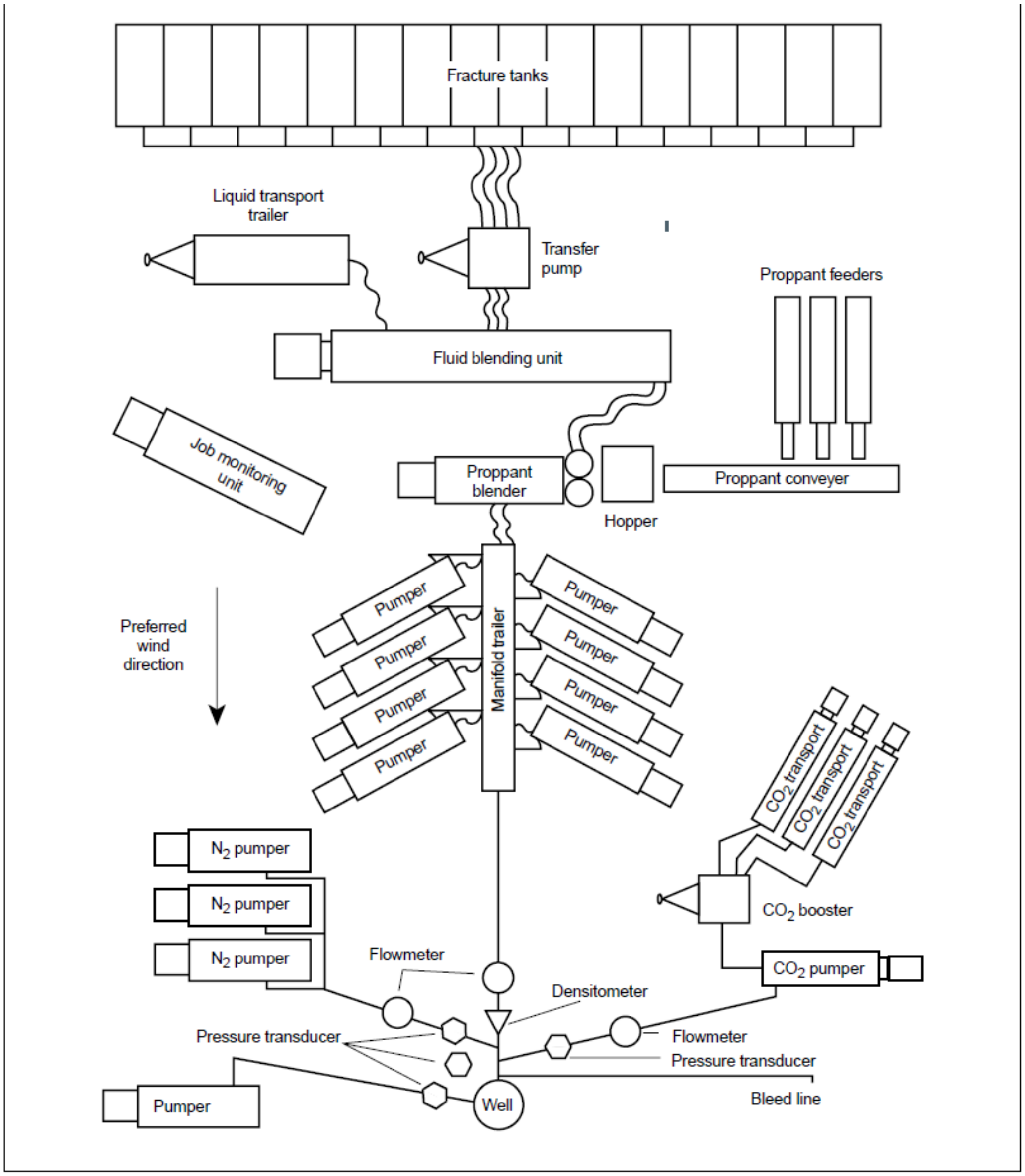

Figure 11-5. *Equipment positions for a typical fracturing treatment.*

Figure 2. Equipment involved in a typical hydraulic fracturing operation.

31. The pumps may be powered by a variety of sources—such as hydrocarbon fuels (e.g., diesel), electric motors, or natural gas—but the basic mechanics of pressurizing a fluid to deliver it from one place to another remain applicable. With reference to **Figure 2**, at each phase one pump or multiple pumps could be used. Water is pumped from the fracture tanks (water storage) to a blending unit. Another pump would also be typically used to transport additives and chemicals to the "blending unit," with the pressure depending on the density and viscosity of the

fluids, among other parameters. Another pump would be used to transport the mixture of water and chemicals to the "proppant blending unit" (also referred to as a "blending unit" or simply "blender" or "mixer"), where a fracturing fluid is formed. Another pump takes the fracturing fluid to the wellhead, but between this pump and wellhead can be numerous intermediary components, such as manifolds (to distribute fluids to multiple locations) and check valves (to prevent fluid from flowing backward).

32. The design of the individual pumps may vary as well, being either centrifugal or positive displacement (plunger) pumps.

33. As indicated in **Figure 2**, some hydraulic fracturing and reservoir stimulation operations may include requirements for pump gas, such as nitrogen (N_2) and carbon dioxide (CO_2). These pumps may be required to pump gas into the wellhead at pressures equivalent to the pumps delivering fracturing fluid to the wellhead.

34. Clearly, there are a plethora of pumps at a typical hydraulic fracturing site, all with a wide range of pump pressure capabilities, spanning thousands of pounds per square inch. Just stating that a pump provides pressure sufficient to fracture a formation says little to nothing about whether that pump should be deemed "high pressure," because many of the pumps *upstream* of the hydraulic fracturing pumps (i.e., the pumps delivering fracturing fluid to a wellbore) can pump at pressures in excess of the pressure required to fracture certain formations (such as shallow, low strength rock formations). Thus, to refer to pumps delivering fracturing fluid to a wellbore as "high pressure," is vague.

35. There is insufficient disclosure in the intrinsic record (claims, specifications, and prosecution histories) to determine with reasonable certainty what the "high pressure" is, and what would differentiate a "high pressure" pump from a pump that is not high pressure.

D. The Pressure Necessary to Fracture Changes with Varying Circumstances

36. One of the changing circumstances that affects the pressure sufficient to fracture a formation is the geographic location of the formation. For example, the Diatomite formations of the San Joaquin Valley, California are relatively shallow with wells relatively vertical, and thus require less pressure, as compared to the pressure needed to fracture a well in some deep west Texas formations in the Permian Basin.

37. The pressure necessary to fracture a rock formation depends on many other complex factors, including: (i) the strength and elastic properties of the formation rock to be fractured; (ii) the reservoir pressure and stress due to the weight of the earth above the target formation rock; (iii) the desired dimensions of the hydraulic fractures; (iv) the properties of the fracturing fluid; (v) the properties of the proppant used to keep open the fractures; (vi) the depth and length of the well; (vii) the size (diameter) of the wellbore and casing; (viii) piping sizes and connections from the pumps to the manifold and to the wellhead. (Economides, Michael J., and Kenneth G. Nolte. 2000. Reservoir stimulation. Chichester, England: Wiley. Chapter 5.)

38. While the strength of rock varies with the type of rock (e.g., sandstone is weak relative to marble) the fracture strength of rock also depends on its depth underground. The state of stress under the ground surface increases with depth, which requires that the pressure to overcome the strength of the rock and propagate a fracture increase with depth below ground.

39. Even within a given rock formation and at a given depth, the pressure to first start a fracture in the rock (i.e., fracture pressure) can vary significantly. The fracture pressure must be sufficient to overcome the stress from the rock and the earth which tries to keep the fracture closed. The difference between the fracture pressure and the earth stress is sometimes referred to as the "net pressure." These concepts are illustrated in **Figure 3**.

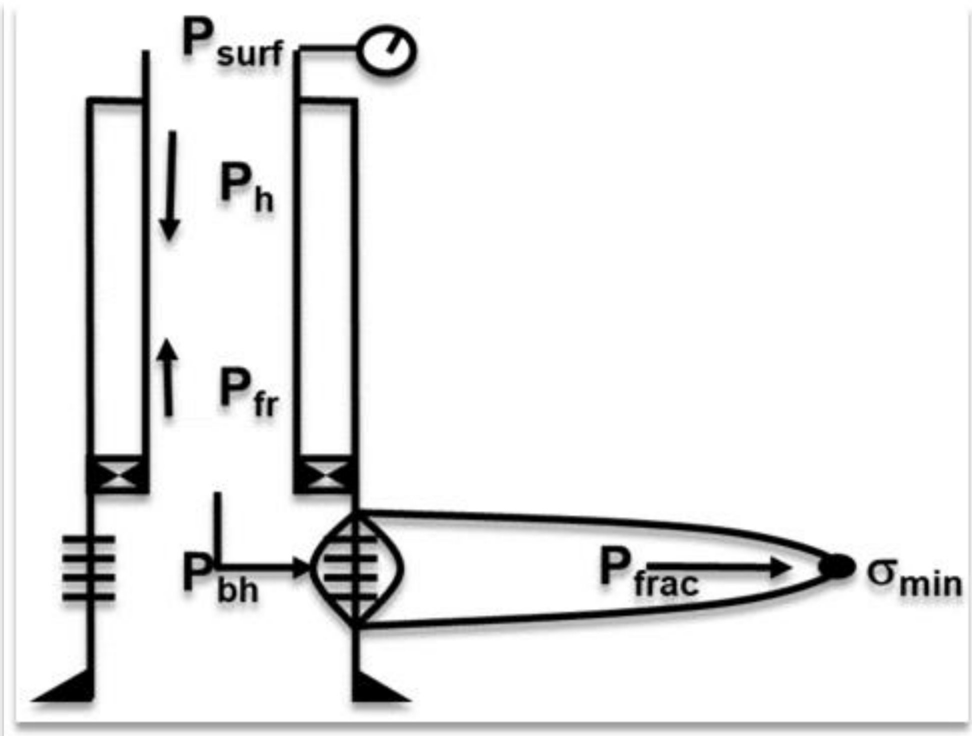

Figure 3. Illustration of well pressures in a hydraulic fracturing operation.

The pressure at the surface is represented by P_{surf}. The pressure at the bottom of the well is referred to as the bottomhole pressure, P_{bh}. The pressure to fracture the rock, P_{frac}, is the pressure that the rock is exposed to after the hydraulic fluid flows through from the fracturing pumps through the numerous intervening equipment (discussed below), down the well, and through the perforations, and acts directly on the rock. The fracture pressure must overcome the earth stress (or pressure), σ_{min}, which resists opening of the fracture. (J.L. Gidley, S.A. Holditch, D.E. Nierode, and R.W. Veatch Jr. (Eds.) (1989), Recent Advances in Hydraulic Fracturing, Society of Petroleum Engineers, Henry L Doherty Series Monograph. v 12. First Printing. AIME Society of Petroleum Engineers Richardson, TX. Chapter 3.) Also, as shown in **Figure 3**, the weight of the hydraulic fracturing fluid generates a column pressure, sometimes called the hydrostatic pressure, P_h, which is at the bottom of the well. The friction pressure drop, P_{fr}, is the pressure loss due to the hydraulic fracturing fluid flowing through the pipe, valves, connections, or other restrictions to flow (further

discussed below). The friction pressure drop depends on the diameter of the flow path (i.e., pipes, valves, etc.) and the pumping rate of the fluid.

40. There are applications that I am personally aware of in which the net pressures to fracture a formation rock were the same for a (i) deep, high stress, weak rock reservoir and a (ii) shallow, low stress, strong rock reservoir. The pressures required at the surface from the hydraulic fracturing pumps, however, were significantly different for each of the wells due to friction pressure drop through the surface and subsurface equipment, and the configuration of the well construction. This illustrates the importance of specifying the hydraulic fracturing pump pressure, as opposed to stating simply "high pressure" sufficient to fracture the formation.

41. In addition, as indicated in **Figure 4**, in many wells hydraulic fracturing operations are performed in "stages," starting at the end of the wellbore (referred to as the "toe") and progressing to the curved transition from vertical to horizontal (referred to as the "heel"). In **Figure 4**, this progression is shown from right to left.

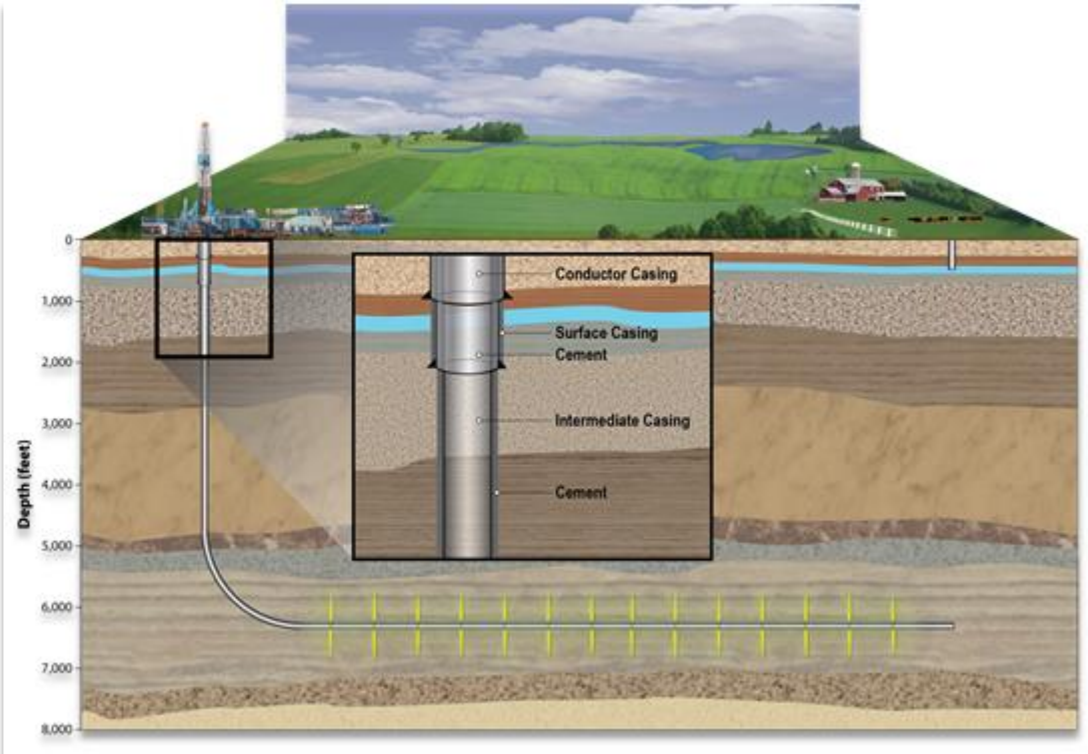

Figure 4. Hydraulic fracturing of a horizontal well with casing, perforations, and fractures. The horizonal segment of the well can be as long or longer than 17,000-ft, or more than three miles. Each stage is typically separated by a "frac plug," and each stage consists of a length of perforations separated by the plugs. The length of the stages, or distances between frac plugs, is typical 50 to 100 ft. The equipment within the lateral or horizontal section also contributes pressure losses, which must be considered when selected the hydraulic fracturing pump. Accordingly, even within a given well, the pressure varies significantly.

E. The Pressure Necessary to Deliver Fluid to the Fracturing Face with Varying Circumstances

42. Pressure can vary significantly from the discharge side of the hydraulic fracturing pump at the surface to the location of the fracture face within the target reservoir. For example, fracturing fluid undergoes a pressure drop through hoses, pipes, valves, and manifolds to get to the wellbore, and then further undergo pressure drops as the fluid passes through the formation.

43. As shown in the photograph of **Figure 5**, the hydraulic fracturing fluid exits the pumps at the discharge end of the hydraulic-fracturing pumps. The hydraulic fracturing fluid then typically flows from the discharge end of hydraulic fracturing pumps through flexible hoses or iron pipes, and then through connections to a skid or trailer-mounted manifold (the "frac manifold," sometimes referred to a "frac missile"). The manifold is complex system composed of steel or iron pipes, valves, and connections.

Figure 5. Pump truck flexible hoses connected to manifold skid.

As shown in **Figure 5**, multiple hydraulic fracturing pumps can be connected to the manifold, and each of the pump connections includes a valve for shutting off pressure from a pump if there is a pumping problem. Moreover, the hydraulic fracturing fluids from each pump are mixed within the manifold, and then exit the manifold through iron pipes and valves, and then to the wellhead. A frictional pressure drop is associated with each of the numerous pipes, valves, and connections,

but can be acquired from the service company or estimated from fluid dynamics texts or handbooks.

44. As shown in the photograph of **Figure 6**, the hydraulic fracturing fluid flows from the hydraulic fracturing pump manifold or missile through numerous valves, connectors, and pipes, and then into the wellhead at the surface.

Figure 6. Wellhead with piping ("iron") connected from pump manifold from pump trucks. There are also numerous connections and valves between the manifold and the wellhead, all of which are sources of frictional pressure drop. There are additional friction pressure drops within the wellhead. Then, there is an additional frictional pressure drop as the fluid travels through the casing in the wellbore, with further decreases through the perforations. The friction pressure drop due to flow through the casing and perforations can be as much as 40% of the wellhead pressure.

45. As indicated in **Figure 4**, hydraulically fractured wells include a vertical segment to the depth of the formation and often a horizontal section (sometimes referred to as "lateral") directionally drilled within the formation. There are, however, many hydraulically fractured wells in reservoir which are drilled vertically, with no horizontal section. Both the vertical and horizontal segments contribute to pipe friction pressure drops. The fluid column within the vertical section of the wellbore also contributes to the total pressure at the bottom of the well. This pressure results from the density of the hydraulic fracturing fluid and proppant, if used. For a shallow well, such as the 1,000-ft deep Diatomite wells of the San Joaquin Valley in California in which steam is used for fracturing the wells, this component of the total pressure at the bottom of the well is smaller than the rock fracture pressure, so the surface hydraulic fracturing pump must provide most of the fracturing pressure. For deep wells, such as the 7,000-ft deep Marcellus formations of Pennsylvania or the 10,000 – 15,000 ft deep wells of the Permian Basin of Texas, the static pressure can be a substantial portion of the pressure to fracture the formation. For such deep wells, the static pressure generated by the hydraulic fracturing fluid in the casing can reduce the pressure required by the hydraulic fracturing pump.

F. The Intrinsic Evidence Does Not Provide Reasonable Certainty as to "High Pressure"

46. The specifications of the Asserted Patents do not provide guidance that would clarify the meaning of the term "high pressure," or allow skilled artisans to differentiate a pump that is "high pressure" from a pump that is "not high pressure."

47. The Asserted Patents simply repeat the language of the claims, but provide no guidance to distinguish between "high pressure" pumps and other kinds of pumps. *See, e.g.,* '410 Patent at Abstract, 1:14-15, 1:45-48, 1:64-67, 2:33-35, 2:48-50. Worse yet, the patents state, "Fracturing rock in a formation requires that the fracture fluid be pumped into the wellbore at very

high pressure." *See, e.g.*, '410 Patent at 1:21-22; *see also* '308 Patent at 1:30-31 (same); '601 Patent at 1:31-32 (same). This begs the question of the difference between "high pressure" (as stated in the claims) and "very high pressure," let alone how this impacts the selection of a hydraulic fracturing pump.

48. Further confusing the use of the term "high pressure" is the ill-defined and vague use of the term "pressure" in the '278 patent. As with the '410, '601, and '308 Patents, the '278 Patent makes no mention at all of the magnitude of the pressure in pounds per square inch, and the term for units of pressure ("psi") is never used in the patent. And similar to the '410, '601, and '308 Patents, the '278 Patent states that fluid is pumped "into the wellbore at *very high pressure*." *Id*. at 1:32-33. The '278 Patent states that parameters are monitored, but does not specify *where* or *how* the pressure is measured, or what range is expected. *See, e.g.*, '278 Patent at 2:20-24 ("The process can further include monitoring at a centralized control unit at least one of the pressure, temperature, fluid rate, fluid density, concentration, …"). The patent further states: "The signals for such controls can include, for example, on/of, speed control, and an automatic *over-pressure* trip." *Id*. at 5:57-59 (emphasis added). But there is no description as to where this "*over-pressure*" is measured, on which piece of equipment it is measured, or how (or if) "over-pressure" relates to "high pressure." Yet another passage refers to "an *over - pressure* event," where "the operator controlled push button for the on / off signal can be deployed immediately such that the pumps stop preventing *overpressure* of the iron." *Id*. at 5:59-62. As discussed above, there are numerous segments of "iron" both upstream and downstream of the hydraulic fracturing pumps.

49. The '278 Patent states that there are numerous places for which pressure can be measured, confirming what I stated above that the pressure does vary across the setup. The monitoring of pressures at various points of the system includes: pressures of fluids "entering and

exiting the well" (7:56-57), blender suction and discharge pressures (8:53-55), hydration unit suction and discharge pressures (10:11-13), "pump discharge pressure, wellhead iron pressure" (10:64-65), fracturing pump discharge pressure and suction pressure (11:58-61), and "pressure between the wellhead and check valve, pressure between the check valve and manifold trailer" (13:7-9) demonstrates the system complexity and pressure variations within the system even before the fluid enters the wellhead. Yet nowhere does the '278 Patent describe the pressure ranges to use, which of these points should be measured for purposes of the claims, and what would be considered "high pressure."

50. The one exception is the '728 Patent. This Patent has a different set of inventors than the other patents, and the specification was significantly changed compared to the others. Unlike the other patents, the '728 Patent does discuss pounds per square inch (psi). The patent discusses in the prior art, slurry was provided "at high pressures (over 10,000) psi." '728 Patent at 1:53-55. Notably, this language is not in any of the other Asserted Patents. Yet in the section describing the invention, the '728 Patent states that the "pressure of the slurry can be increased up to around 15,000 psi …." *Id.* at 4:43-45. This language is also not in the '410, '601, '308, or '278 Patents. Nevertheless, the remaining ambiguities discussed throughout my declaration, such as *where* the pressure is measured, are not resolved by the '728 Patent.

51. I have reviewed the file histories of the Asserted Patents and did not find the inventors defining "high pressure," or further discussing any objective way to classify and differentiate between "high pressure" pumps and those that are not high pressure. The prosecution histories of the Asserted Patents do not add any further clarity to the "high pressure" terms.

52. Thus, in my opinion, the term "high pressure" is relative to the application in which the pump is being used, and is a vague and ill-defined term of degree.

VI. CONCLUSION

53. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 27, 2021.

/s/ L. Brun Hilbert Jr

Dr. L. Brun Hilbert, Jr.

Appendix A

Exponent®
Engineering & Scientific Consulting

L. Brun Hilbert, Jr., Ph.D., P.E.

Principal Engineer | Mechanical Engineering
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Professional Profile

Dr. Hilbert has been consulting at Exponent since 1996 in the fields of mechanical and petroleum engineering, with special applications to engineering mechanics and geomechanics. He has worked in the petroleum exploration and production industry for 40 years.

Dr. Hilbert has expertise in mechanical and petroleum engineering. In the area of petroleum engineering, he has expertise in oil and gas well design and integrity, hydraulic fracturing, well production and wellhead equipment, blowouts and well control, drilling mechanics and directional drilling, reservoir geomechanics, reservoir reserves estimation, fixed and floating offshore platforms. He also has experience with natural gas and liquid hydrocarbon storage in solution-mined salt caverns and depleted hydrocarbon formations. In the area of geomechanics, Dr. Hilbert has expertise in evaluating the structural integrity of oil and gas wells in compacting or deforming reservoir rocks, in the stability of underground storage structures and nuclear waste repositories, and he assists clients in failure analysis involving soil-structure interaction, including pipelines. Dr. Hilbert has experience in intellectual property litigation, with particular focus on the oil and gas industry.

Prior to joining Exponent, Dr. Hilbert was employed as an Engineering Specialist for Exxon Production Research Company, where he performed research and taught courses in Well Completions and Workovers in the Middle East, Southeast Asia, Australia, and North America.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Mineral Engineering, University of California, Berkeley, 1995

M.S.E., Mechanical Engineering, University of New Orleans, 1981

B.S., Mathematics, University of New Orleans, 1979

National Academy of Engineering Committee on Connector Reliability for Offshore Oil and Natural Gas Operations, 2017-2018

Society of Petroleum Engineers Distinguished Lecturer, 2015-2016

Jane Lewis Fellowship in Geomechanics

Mathematical Association of America Membership Award

Outstanding Instructor, Exxon Production Research Company 1991

Outstanding Instructor, Exxon Company, U.S.A. 1990

Licenses and Certifications

Licensed Professional Mechanical Engineer, California, #M31490

Licensed Professional Engineer, New Mexico, #20939

Licensed Professional Engineer, Texas, #112060, Mechanical and Petroleum Engineering

Prior Experience

Lawrence Berkeley National Laboratory, 1996

University of California at Berkeley, 1992-1996

Exxon Production Research Company, 1981-1992

Professional Affiliations

American Society of Mechanical Engineers

Society of Petroleum Engineers

American Rock Mechanics Association

Publications

Papers and Articles

Hilbert LB and Hallai JF. Natural Gas Production in Extreme Weather (Guest Commentary). Pipeline & Gas Journal. Vol. 248, No, 6, June 7, 2021.

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